

# NUMBER TRICKS

by Theoni Pappas

**The amazing 23 tricks**—from *Teaching Mathematics* by Max Solbel & Evan Maletsky.

steps:

- 1) Pick a 2-digit number great than 50.
- 2) Add 76 to it.
- 3) Take of this result's hundred's digit and add that digit to the new result.
- 4) Finally, subtract this result from the number you chose.
- 5) Write your answer on a piece of paper, and hand it to me.
- 6) Burn this somewhere safe, or use your magic ashes on the paper, rub gently over to top of your hand where you had written the number 23 using a bar of soap, ahead of time.

## **22 again problem**

- 1) Pick three different digits greater than 0.
  - 2) Using these form all possible two digit numbers.
  - 3) Add up the six two-digit numbers you made.
  - 4) Add up the 3 digits you originally selected.
  - 5) Divide the sum of the six 2-digits numbers by the sum of the three digits.
- Why did we all get 22.*

## **The 1089 problem**

- 1) Pick any 3-digit number in which the 100's place & the one's place digits differ by 2.
- 2) Reverse the one's and 100's digit.
- 3) Subtract the smaller number from the larger one.
- 4) Reverse its. one's and 100's digit.
- 5) Add the last two results...it always comes out to be 1089.

## **Can't get rid of 1 problem**

- 1) Pick any whole number. It doesn't matter what size it is.
- 2) Add 3 to it.
- 3) Now multiply this **sum** by 2.
- 4) Subtract 4 from this **product**.
- 5) Divide this **difference** by 2.
- 6) Finally, subtract your original pick from this **quotient**.

# Solutions to number tricks

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## HOW THE TRICKS WORK

### The amazing 23 trick

Picked ab. Write extended in base ten

$$10a + B$$

$$10a + b + 76$$

$$10a + b + 76 - 100 + 1$$

$$10a + b - 23 - (10a + b) = 23$$

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### 22 again problem

The three choices are represented by a, b, c.

Two digit numbers formed are:

ab, ac, ba, bc, ca, cb

Add the up: by writting each # in base ten form:

$$10a+b$$

$$+ 10a+c$$

$$+ 10b+a$$

$$+ 10b+c$$

$$+ 10c+a$$

$$+ 10c+b$$

$$22a+22b+22c = 22(a+b+c)$$

dividing this by (a+b+c) gives **22**

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### The 1089 problem

Since the 100s and 1s digits differ by 2, call one **a** and the other is **a-2**. Call the 10s digit **b**.

Our number is **a b (a+2)**. Reversing the 100s and 1s digits, we get **(a+2) b a**.

We subtract the smaller from the larger:

(a+2) b a - a b (a+2). Now write this in base ten form:  $100(a+2)+10b+a - 100a-10b-(a+2)$

Simplifying this, we get  $200-2 = 198$

Reversing these digits, we get 981

Adding these we get  $198+981 = 1089$

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### Can't get rid of 1 problem

- Let **n** represent the whole number that is chosen.
- Add 3 to it:  $n+3$
- Multiply this sum by 2:  $2n+6$
- Subtract 4:  $2n+6 - 4 = 2n+2$
- Divide by 2:  $(2n+2) \div 2 = n+1$
- Subtract your original # from this quotient:  
 $n+1 - n = 1$